40 kc/s to 50 Mc/s

OSCILLATOR

TYPE TF 1246

270 Freq

Central Lab

INSTRUCTION MANUAL

MP MASTER

MA31176

MARCONI INSTRUMENTS LIMITED

EB 1246
1 - 4/59

OPERATING INSTRUCTIONS No. EB 1246

for

40 kc/s to 50 Mc/s OSCILLATOR

TYPE TF 1246

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MARCONI INSTRUMENTS
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DRAWINGS	Ref.No.
COMPLETE CIRCUIT DIAGRAM OF OSCILLATOR SECTION	TC 27396
COMPLETE CIRCUIT DIAGRAM OF POWER UNIT SECTION	TC 27437
FUNCTIONAL DIAGRAM	TLB 28414
MAINS INPUT ARRANGEMENTS	TLC 27612/1

SCHEDULE OF PARTS SUPPLIED

1. One Oscillator Type TF 1246 complete with attached mains lead and valves, etc. as under:-

Valves:	Two:	Type 5763, Beam Tetrodes.
	One:	Type 6X4, Full-Wave Rectifier.
	One:	Type 6AK5, Pentode.
	One:	Type 5651, Voltage Stabilizer.
Fuses:	One:	2A, Cartridge.
	One:	150 mA, Cartridge.
Lamp:	One:	6.3V, 0.15A, M.B.C., Pilot Lamp.

2. One Instruction Book No. EB 1246.

The following item is an optional accessory for use with the oscillator and is supplied only if specially ordered.

50 Ω Matching Unit Type TM 5726; enables oscillator to be used as a 50 Ω general-purpose test source.

1 DESCRIPTION

1.1 GENERAL

The 40 kc/s to 50 Mc/s Oscillator Type TF 1246 is primarily intended as a test-circuit energizing source for the Marconi Circuit Magnification Meter Type TF 1245; after the addition of an optional matching unit, it can also be used as a general-purpose wide-band oscillator for such applications as energizing an r.f. bridge.

To suit the Circuit Magnification Meter, the output circuit of the Oscillator is designed to operate into a resistive load of 0.5 Ω, across which it will develop an output variable up to about 600 mV. However, so that the use of the Oscillator is not limited to this specialized application, an optional Matching Unit, Type TM 5726, is available to convert its low output impedance to a nominal 50 Ω; with the matching unit connected, the maximum output across a 50 Ω load is variable up to approximately 4 V.

In its normal application the output of the Oscillator is monitored by the Q-Multiplier meter of the Circuit Magnifiaction Meter; for this reason, no monitoring arrangements are included in the Oscillator itself.

1.2 DESIGN DETAILS

The general arrangement of the electrical circuit is shown on the Functional Diagram No. TLB 28414; the complete Circuit Diagram of the oscillator section is given on Drawing No. TC 27396 and of the power unit section on Drawing No. TC 27437.

Reference to these diagrams should assist the reader in fully understanding the circuit description in this section.

1.2.1 Oscillator Circuit

The output frequency is generated by a single-valve oscillator circuit incorporating a beam tetrode valve, V101. The frequency coverage, 40 kc/s to 50 Mc/s, is divided into eight ranges; the appropriate range is selected by means of a front-panel control coupled to a turret on which are mounted the tuning inductors, L103, to L110, and their associated components. Tuning over each range is accomplished by means of capacitor C105.

The screen and anode of V101 are both bypassed to chassis, and the valve functions as a grounded-anode triode oscillator. On the four lowest ranges (up to 2.5 Mc/s), the circuit is of an inverted-Hartley type. Over the fifth and sixth ranges (2.5 to 14 Mc/s)a tuned-cathode

1.2.1 (continued)

circuit is used, with inductive feedback to the valve grid, so that the impedance presented in the cathode circuit is sufficient to maintain maximum efficiency. Above 1M kc/s, the maximum efficiency is maintained again by the use of a Modified-Hartley circuit, but with the effective value of tuning capacitance reduced by the connection of a fixed capacitor in series with C105.

1.2.2 Output Arrangements

Although, with respect to r.f. voltages, the anode and screen of V101 are coupled together, a stabilized d.c. voltage is applied separately to the screen via a variable potentiometer, RV101. By adjustment of the screen d.c. potential, the current through the valve, and therefore the level of oscillation, can be determined. The screen voltage control - designated OUTPUT LEVEL - is uncalibrated. Output level is monitored by a voltmeter on the TF 1245 Circuit Magnification Meter.

The load which terminates the Oscillator output, i.e. the input resistance of the TF 1245, is 0.5 Ω. The impedance coupled into the oscillator tuned circuit is, however, largely reactive. This is due to (i) the secondary self-inductance and (ii) the fact that, for convenience, an unmatched 50 Ω connecting cable is used. If the effect of coupled impedance is allowed to vary, then the frequency of oscillation will also vary. Therefore it will be seen that the frequency calibration will only be accurate if the correct load is connected to the Oscillator. To ensure that this is always the case, the Circuit Magnification Meter is provided with a special 50 Ω coaxial lead, Type TM 5725, which should always be used for coupling to the Oscillator.

To enable the Oscillator to be used as a 50 Ω source, an optional Matching Unit, Type TM 5726, is available. This accessory takes the form of a 100:1 impedance step-up transformer, the primary of which is a single straight conductor; the secondary is wound on a mu-metal former toroidally around the primary. The Matching Unit output socket is a 50 Ω type BNC. The load presented by the Matching Unit and its cable to the oscillator is such that the frequency calibration of the latter is still correct. (With earlier units, at outputs greater that 1V the calibration is only maintained above 200 kc/s.)

1.2.3 Power Supply Circuit

The mains transformer has a double-wound primary which is tapped to allow operation from mains supplies within the ranges 100 to 150V and 200 to 250V.

The oscillator h.t. and l.t. are derived from a built-in power unit. The anode voltage for the oscillator valve is taken from the cathode of the full-wave rectifier, capacitance smoothed, and applied direct to the anode of the valve. The screen supply is stabilized by a series-regulator circuit before application to the screen voltage - OUTPUT LEVEL - potentiometer, which controls the oscillator output.

The heater voltages for all valves are taken from two 6.3V windings on the mains transformer.

2 INSTALLATION

The Oscillator Type TF 1246 is dispatched with all valves in their holders and with its mains-input circuit adjusted for immediate operation from 240V, 40 to 200 c/s supplies, unless otherwise specified at the time or ordering.

The instrument can be adjusted for operation from any supply voltage within the ranges 100 to 150V and 200 to 250V. To check or alter the settings of the mains transformer tappings, refer to Section 2.1 which follows.

2.1 MAINS INPUT ARRANGEMENTS

2.1.1 General

The mains transformer has a double-wound primary, and its two tapped sections are connected in series-parallel for 100 to 150V operation, or in series for 200 to 250V operation.

The mains input to the transformer is carried on two fly-leads connected by screws to a mains tapping panel. Attached to the tapping panel is a pierced reference plate which is reversible and marked with a selection of voltages. On one side of the plate, the voltages are applicable to the 100 to 150V range; on the other side to the 200 to 250V range.

The two main sections of the primary are connected together by a link or links; these links are used to join the appropriate solder tag terminals which are mounted directly on the transformer coil. To change from one major voltage to the other, the linking between the transformer tags is altered; to change by an increment within one of the major voltage ranges, the positions of the screw-secured fly-leads on the tapping panel are altered. Diagram TLC 27612/1, included after page 8, shows, in schematic form, the method of adjusting the mains transformer.

The fly-lead connections to the mains tapping panel can be viewed through a transparent plastic cover on the rear case panel. To gain access to the tapping panel, release the single captive screw which secures the cover of the case panel.

To examine the link connections on the transformer coil, remove the rear case panel as follows: detach the two screws holding the panel to the back of the instrument; detach the two screws on the underside at the rear of the instrument. The panel can then be removed and the transformer will be seen mounted adjacent to the mains tapping panel.

2.1.2 Operation from 200 to 250V, 40 to 100 c/s Supplies

To adjust the instrument to operate from 200 to 250V supplies, connect the link of the transformer coil as shown in Fig. 1 of TLC 27612/1. Then adjust the fly-lead connections, as necessary, to suit the local Supply voltage.

2.1.3 Operation from 100 to 150V, 40 to 100 c/s Supplies

To adjust the instrument to operate from 100 to 150V supplies, connect the links on the transformer coil as shown in Fig. 2 of TLC 27612/1. Then adjust the fly-lead connections, as necessary, to suit the local Supply voltage.

3 OPERATION

3.1 SWITCHING ON AND WARMING UP

Be sure that the instrument is correctly adjusted to suit the particular supply to which it is to be connected. Then proceed as follows:-

(1) Connect the mains lead to a supply socket. The lead is permanently attached to the instrument and is cleated, when not in use, by two spring clips on the rear case-panel.

(2) Switch ON by means of the SUPPLY switch. The pilot lamp should now glow.

Before proceeding further, wait two or three minutes for the valves and internal circuits to warm up. If a very high order of stability is required, extend this period to approximately half an hour.

3.2 SETTING OUTPUT FREQUENCY AND LEVEL

3.2.1 Tuning

The Oscillator covers frequencies from 40 kc/s to 50 Mc/s in eight ranges as follows:-

RANGE	FREQUENCY COVERAGE
A	40 to 80 kc/s
B	80 to 250 kc/s
C	250 to 800 kc/s
D	800 to 2,500 kc/s
E	2.5 to 6.0 Mc/s
F	6 to 14 Mc/s
G	14 to 30 Mc/s
H	30 to 50 Mc/s

To set the Oscillator to a particular frequency: switch the RANGE control to the required range; tune to the desired frequency; and read the frequency on the tuning-dial calibration-arc appropriate to the RANGE setting selected.

It should be remembered that the frequency calibration is only accurate, for reasons explained in Section 1.2.2, when the output is correctly terminated. For details of output termination, refer to Sections 3.3 and 3.4.

NOTE: The black dots on the tuning dial denote those frequencies at which the Capacitance-Inductance Conversion Chart on the Q-Meter may be used.

3.2.2 Adjusting Output Level

Adjust the uncalibrated OUTPUT LEVEL control to give an output level suitable for application to associated equipment. The output can be applied to (i) the Marconi Circuit Magnification Meter TF 1245, or (ii) a 50 Ω load. These applications and the output levels available are discussed in Sections 3.3 and 3.4 respectively.

3.3 USE WITH CIRCUIT MAGNIFICATION METER TF 1245

The main function of this Oscillator is to provide a test-circuit energizing voltage for the Circuit Magnification Meter TF 1245, and, in this role, may be considered as an integral part of that instrument. Therefore, it has been found expedient to include the relevant operational procedure for the Oscillator in the handbook for the Circuit Magnification Meter.

When used with the TF 1245, the Oscillator output level is continuously variable up to a maximum of about 600 mV. This full-output level enables the maximum Q-reading multiplication factor to be attained adequately.

3.4 USE AS A 50 Ω SOURCE

In addition to its use with the TF 1245, the Oscillator can be employed as a general-purpose test source having a nominal output impedance of 50 Ω. To obtain this condition, it is necessary to couple the optional Matching Unit Type FM 5726 to the R.F. OUTPUT socket of the Oscillator.

It should be noted that, with the Matching Unit connected, the Oscillator is arranged to work into a 50 Ω load. If it is required to feed the Oscillator into any other value of load resistance, first match the load to within at least ±10 Ω by the addition of a series or parallel resistance.

With a 50 Ω load connected to the Matching Unit output socket, the voltage developed across the load is continuously variable from zero to a maximum of approximately 4V.

The Matching Unit has a 50 Ω BNC socket. Listed below are reference numbers given by several authorities and manufacturers to some of the BNC plugs which will fit the outlet.

Great Britain,	Air Ministry:	10H/20935
	Films and Equipments Ltd:	UG-88/U
		UG-913/U
	Belling and Lee Ltd:	L.1331/FP
		L.1331/RFP
	Transradio Ltd: "	BN.1/5
		LN.7/5
United States,	Military No.:	UG-88/U
		UG-913/U

4 MAINTENANCE

4.1 FUSES

The Oscillator is protected by two fuses. One is in series with the mains transformer primary and the other is in the h.t. secondary centre-tap line. Both are standard 1 inch long, 1/4 inch diameter cartridge fuses. The fuse in the primary is rated at 2A, and the fuse in the h.t. secondary at 150 mA. Both fuses are accessible at the rear of the instrument and can be replaced without removing the rear case-panel.

4.2 ACCESS TO COMPONENTS

4.2.1 General

The valves may normally be replaced without special selection. The power-supply valves, V1 to V4, are immediately accessible on removing the rear case-panel as described in Section 4.2.2, paragraph (1). The oscillator valve is accessible after removing the oscillator unit cover as described in Section 4.2.3.

4.2.2 Removal of Power Unit

(1) Remove the rear case-panel after detaching four screws; two of the screws hold the panel to the back of the instrument and the remaining two are on the underside at the rear.

(2) Detach the two screws, one on either side of the power unit, which hold the chassis to the main framework of the instrument. The chassis can then be withdrawn.

The unit remains attached to the instrument, however, by the leads soldered to the power-unit connection panel. The length of the leads is sufficient to permit all normal maintenance operations to be carried out. Should it be necessary to remove the unit completely, unsolder the eight leads from the panel; note the cable-form colour sequence for subsequent replacement.

4.2.3 Removal of Oscillator Unit Cover

(1) Remove the power unit as described in Section 4.2.2 but do not unsolder the leads from the power-unit connection panel.

(2) Detach the case top-panel by undoing the four screws holding it to the top of the instrument.

(3) Remove the eight screws, four at the top and four at the bottom, which secure the oscillator-unit cover in position. The cover can then be withdrawn.

4.3 WORKING VOLTAGES

The voltages given in this section, for guidance when servicing the instrument, were obtained from a representative TF 1246; the voltmeter used was an Avometer Model 8, which has a resistance of 20,000 ohms/volt.

All voltages should be measured with the correct supply voltage applied to the appropriate transformer-primary tapping (e.g., 240 V applied to the 240 V tap).

All measurements are made with respect to chassis unless otherwise stated.

Mains transformer, h.t. secondary:	350-0-350 V a.c.
" " LT 1 (between pins 4 and 5 of V2):	6.3 V a.c.
" " LT 2 (connector panel tag 3)	6.3 V a.c.
H.T. unstabilized (connector panel tag 2):	350 to 440 V d.c. *
H.T. stabilized (connector panel tag 1):	245 V d.c.
V101 anode voltage (pin 1):	110 to 370 V d.c. *

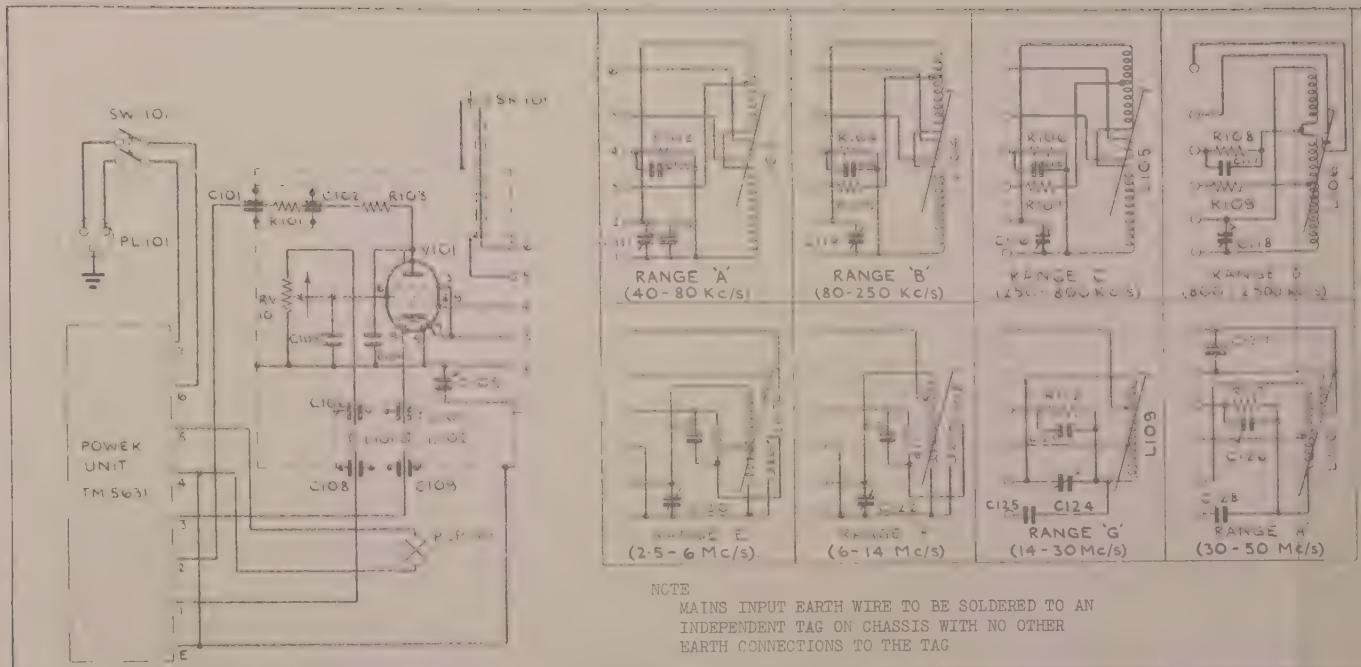
* The level of this voltage will depend on the anode current drawn by the oscillator valve at any particular frequency and r.f. output level. These figures are only included to give guidance as to the expected range.

4.4 ADJUSTMENT OF PRESET CONTROLS

The level of the stabilized h.t. voltage from the power unit is adjusted by potentiometer RV1. With the correct supply voltage applied to the mains inlet, RV1 is set to give 245 V d.c. at connector panel tag 1.

The only other preset controls are the inductors and trimmer capacitors associated with each frequency range. Adjustment of these presets follows normal practice, namely, setting inductance at the low-frequency end of a range and capacitance at the high-frequency end, and is quite straightforward. However, it is important that, for reasons explained in Section 1.2.2, the r.f. output is always correctly terminated. This termination must be either the Circuit Magnification Meter TF 1245 or the optional Matching Unit TM 5726, itself loaded with 50 Ω resistance.

To adjust the inductors and capacitors, first remove the oscillator unit cover as described in Section 4.2.3. To simplify access to the trimmer capacitors, it is advisable to remove the bottom case-panel by undoing the two remaining screws on the underside of the instrument. The tuning assembly 'in circuit' at any particular setting of the RANGE switch is at the bottom of the turret disk.



NOTE
MAINS INPUT EARTH WIRE TO BE SOLDERED TO AN INDEPENDENT TAG ON CHASSIS WITH NO OTHER EARTH CONNECTIONS TO THE TAG

REF	RESISTORS		STOCK LIST
R101	2·2K ± 10%	6W	2 TM 5273D
R102	100K ± 2%	½W	18/TM 5632
R103	2·2K ± 10%	6W	36/TM 5630
R104	100K ± 2%	¼W	12/TM 5632
R105	330Ω ± 2%	¼W	13/TM 5632
R106	100K ± 2%	¼W	12/TM 5632
R107	220Ω ± 2%	¼W	14/TM 5632
R108	15K ± 2%	¼W	17/TM 5632
R109	33Ω ± 2%	¼W	15/TM 5632
R110	3·3K ± 2%	½W	16/TM 5632
R111	3·3K ± 2%	½W	16/TM 5632
R112	3·3K ± 2%	½W	16/TM 5632
R113	3·3K ± 2%	½W	16/TM 5632
RV101	50,000Ω ± 10%	1W	37/TM 5630

REF	CAPACITORS	STOCK LIST
C101	4700pF	5/TM 5273D
C102	4700pF	5/TM 5273D
C103	·01μF ± 10% 400V	40/TM 5630
C104	·01μF ± 10%	[illegible]
C105	532 pF SWING	27/TM 5633
C106	4700pF	5/TM 5632
C107	4700pF	5/TM 5632
C108	4700pF	5/TM 5632
C109	4700pF	5/TM 5632
C110	22pF ± 10% 500V	[illegible]
C111	3-19·5pF AIR TRIMMER	4/TM 5633
C112	2pF ± 2% 750V	[illegible]
C113	22pF ± 10% 500V	[illegible]
C114	3-19·5pF AIR TRIMMER	4/TM 5633
C115	22pF ± 10% 500V	21/TM 5632
C116	3-19·5pF AIR TRIMMER	4/TM 5633
C117	100pF ± 2% 750V	19/TM 5632
C118	3-19·5pF AIR TRIMMER	4/TM 5633
C119	300pF ± 20% 600V	22/TM 5632
C120	3-19·5pF AIR TRIMMER	4/TM 5633
C121	300pF ± 20% 600V	22/TM 5632
C122	3-19·5pF. AIR TRIMMER	4 TM 5633
C123	300pF ± 20% 600V	22 TM 5632
C124	3-19·5pF AIR TRIMMER	4 TM 5633
C125	350pF ± 5% 750V	23 TM 5632
C126	300pF ± 20% 600V	22/TM 5632
C127	41pF ± 2% 750V	20/TM 5632
C128	150pF ± 5% 750V	24/TM 5632

REF	MISCELLANEOUS	STOCK LIST
L101	COIL	1/TM 5273E
L102	COIL	2/TM 5273E
L103	COIL	1/TM 5633/1
L104	COIL	1/TM 5633/2
L105	COIL	1/TM 5633/3
L106	COIL	1/TM 5633/4
L107	COIL	1/TM 5633/5
L108	COIL	1/TM 5633/6
L109	COIL	1/TM 5633/7
L110	COIL	1/TM 5633/8
V101	VALVE QV03-12	39/TF 246
SK101	CO-AX SOCKET	29/TM 5630
P.L.01	PLUG MAINS	36/TF 1240
P.L.02	LAMP	17/TF 1246
SW 101	SWITCH	19/TF 1240

15

TITLE CIRCUIT DIAGRAM FOR 40 Kc/s TO 50Mc/s OSCILLATOR

DRN K H W	ASSY TE 27390
DATE 4 12 57	WIRING
CHKD J T	S LIST VARIOUS
APP D W	DRAWING N° TC 27396
TRCD T D S	

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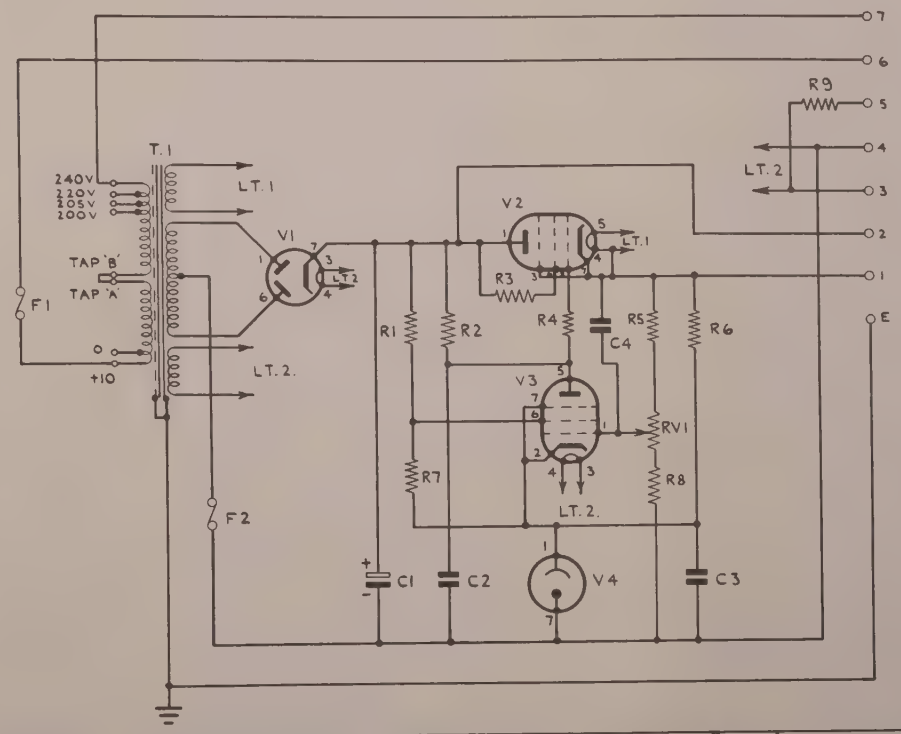

REF.	RESISTORS		STOCK LIST
R1	330K Ω ± 10%	1/4 W	32/TM 5631
R2	1M Ω ± 10%	1/4 W	31/TM 5631
R3	100 Ω ± 10%	1/4 W	30/TM 5631
R4	4·7K Ω ± 10%	1/4 W	33/TM 5631
R5	150K Ω ± 10%	1/4 W	36/TM 5631
R6	47K Ω ± 10%	1/2 W	35/TM 5631
R7	47K Ω ± 10%	1/4 W	34/TM 5631
R8	82K Ω NOM. A.I.C.	1/2 W	37/TM 5631
R9	10 Ω ± 10%	1/2 W	38/TM 5631
RV1	30K. VAR.		39/TM 5631

REF.	CAPACITORS	STOCK LIST
C1	8μF $^{-30\%}_{+50\%}$ 500V D.C.	42/TM 5631
C2	300pF ± 20% 600V.	43/TM 5631
C3	·01μF ± 10% 400V	44/TM 5631
C4	0·1μF 350V	45/TM 5631
	VALVES	
V1	6 x 4	38/TF 1246
V2	QV03-12.	39/TF 1246
V3	6AK5	40/TF 1246

REF.	VALVES	STOCK LIST
V4	85A2	41/TF 1246
	MISCELLANEOUS	
T1	TRANSFORMER	1/TM 5631
TS1	TAG STRIP	18/TM 5631
F1	FUSE LINK 2A	60/TM 5631
F2	FUSE LINK 150mA	61/TM 5631

7

TITLE. POWER UNIT.

DRN K.H.W.	ASSY. TD 27435
DATE. 5·12·57.	WIRING.
CHKD.	S. LIST. TM 5631.
APP. D.W.	DRAWING N° TC 27437
TRCD. T.D.S.	

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FUNCTIONAL DIAGRAM

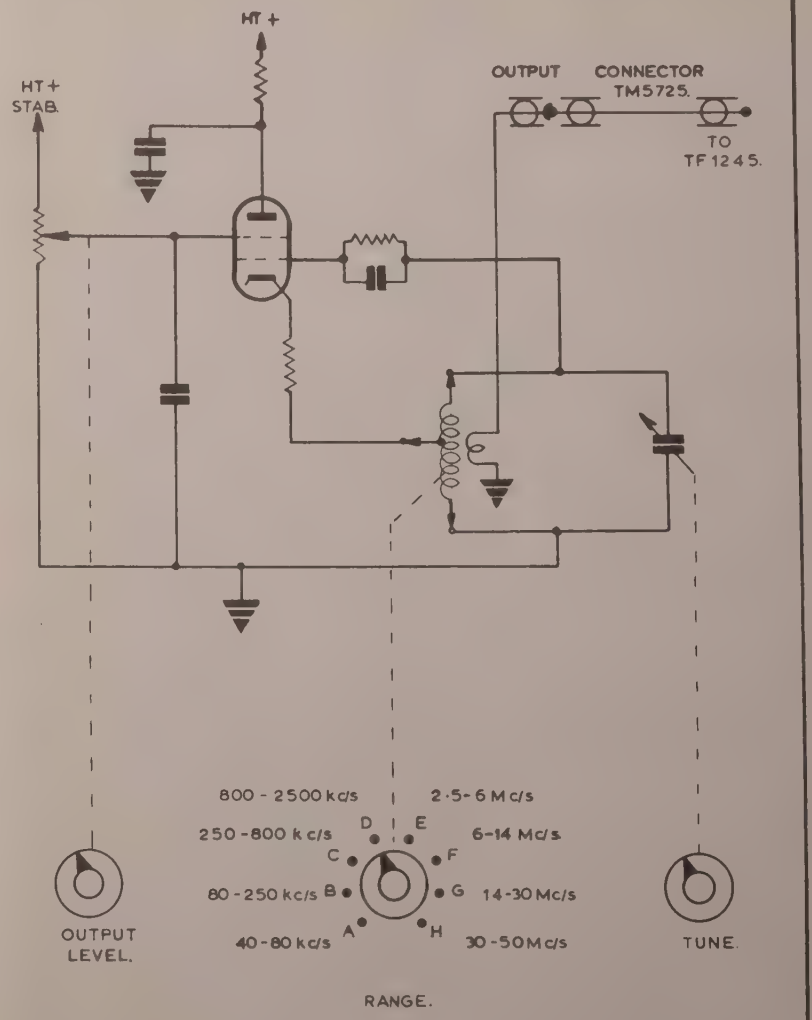
OF

40 kc/s TO 50 Mc/s OSCILLATOR

TYPE TF 1246.

MARCONI INSTRUMENTS LIMITED.

1-8/58 M.I. 8/85

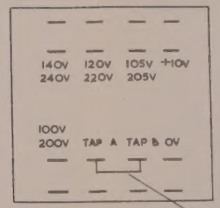


FUNCTIONAL DIAGRAM OF

40 kc/s TO 50 Mc/s OSCILLATOR TYPE TF1246.

TL.B.28414.

MAINS INPUT CONNECTIONS
100-150/200-250 VOLT PRI.
TRANSFORMERS.



FOR
200-250 VOLTS
MAINS SUPPLIES

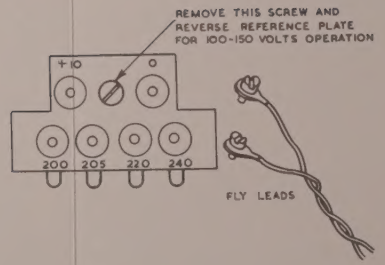
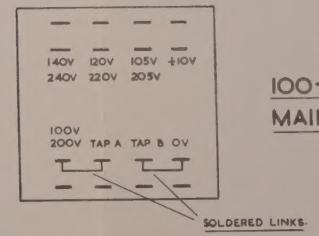
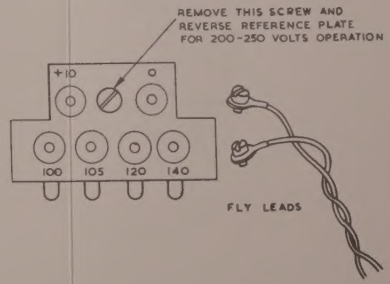


FIGURE 1.



FOR
100-150 VOLTS
MAINS SUPPLIES



A ARRANGEMENT OF PRIMARY
SOLDER TAG CONNECTIONS
ON MAINS TRANSFORMER

B MAINS TAPPING PANEL
CONNECT THE FLY LEADS TO GIVE
A COMBINATION TO SUIT MAINS VOLTAGE
ONE FLY-LEAD MUST GO TO EITHER '+10' OR '0' TAP

FIGURE 2.

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M.I. 8/65

MAINS INPUT CONNECTIONS.

TLC 27612/1

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